

BUILDING A SHARED DEFINITIONAL MODEL OF LONG DURATION HUMAN SPACEFLIGHT

M. Orr¹, A. Whitmire², L. Sandoval³, L. Leveton⁴, D. Arias²

¹ Auckland University; ² Wyle Life Sciences and Engineering; ³ University of Texas Austin; ⁴ NASA Johnson Space Center

OBJECTIVE

To establish a shared definitional model of long duration human spaceflight, to provide a framework and vision for related communication, research and practice.

BACKGROUND/MOTIVATION

In 1956, on the eve of human space travel Strughold first proposed a “simple classification of the present and future stages of manned flight” that identified key factors, risks and developmental stages for the evolutionary journey ahead. As we look to optimize the potential of the ISS as a gateway to new destinations, we need a current shared working definitional model of long duration human space flight to help guide our path.

METHODS

Initial search of formal and grey literature augmented by liaison with subject matter experts. Search strategy focused on both the use of term *long duration mission* and *long duration spaceflight*, and also broader related current and historical definitions and classification models of spaceflight. The related sea and air travel literature was also subsequently explored with a view to identifying analogous models or classification systems.

RESULTS

There are multiple different definitions and classification systems for spaceflight including phase and type of mission, craft and payload and related risk management models. However the frequently used concepts of *long duration mission* and *long duration spaceflight* are infrequently operationally defined by authors, and no commonly referenced classical or gold standard definition or model of these terms emerged from the search.

The categorization (Cat) system for sailing was found to be of potential analogous utility, with its focus on understanding the need for crew and craft autonomy at various levels of potential adversity and inability to gain outside support or return to a safe location, due to factors of time, distance and location.

DISCUSSION AND IMPLICATIONS FOR THEORY AND PRACTICE

Definitional models can help stimulate and shape thought and build a shared language and understanding of the strengths and gaps and potential of our theory and practice. Our preliminary findings suggest the absence of a current dominant widely used definitional model for Long Duration Human Spaceflight Missions (at least in the English language literature).

We propose the need to establish a core definition of Long Duration Human Spaceflight Mission and then build towards a broader categorization model that emphasizes a greater multidimensional nature for the concept rather than just time duration. This model could be analogous to the “Cat” system used in sailing where categories are related to level of required autonomy capacity and potential adversity (with sailing already forming the basis of much of our language and vision of space travel).

If ISS is to act as an Analogue or developmental staging post or gateway to new destinations, we need to have a shared understanding of how it may be both similar and different from the requirements of the next developmental stage or category of long duration missions. A “Long Duration Mission” will be an evolving concept as our context, assumptions and perceptions change. However any categorical model requires as a minimum the ability to capture the distinction between long duration *orbital* flight and long duration *extra orbital* flight where time and distance from earth will require greater autonomy capacity in the face of potential emergent and increasing adversity